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## DISCUSSION ON NON-SUPPURATIVE ANKYLOSIS OF JOINTS.

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Introduced by WILLIAM ANDERSON.

IT has probably appeared to most of us that the pathology of the joint lesions which lead to ankylosis is still incomplete. Mr. Howard Marsh, in his valuable paper read before the British Medical Association in July of last year, has led the way towards a better knowledge by recording a number of instances in which bony ankylosis had occurred independently of suppuration, some dependent upon rare conditions which have as yet received little attention, some upon tubercular and other lesions of a more familiar nature. It is in this manner we must look for advance of knowledge, and we must look in all directions.

Ankylosis is commonly regarded as a question of purely surgical interest, but it should not be so; for some of the most interesting contributions towards a new and broader study will come from physicians, whose experience brings them in contact with cases, often of great complexity, which may never reach the surgical ward or consulting room. If we are to learn the subject as a whole, our survey must be as wide as possible, and we must record with especial care every example that appears difficult to understand. When the accumulated material is sufficiently large we may hope to fill up many, if not all of the gaps in our pathological knowledge.

It is not desirable to separate fibrous and osseous ankylosis in our inquiry, because the same causes may lead to either, or the first may undergo conversion into the second; moreover, it is difficult to diagnose between the two until the parts are examined under an anæsthetic, or exposed by the knife.

I shall venture to offer a tentative classification of the group of non-suppurative ankyloses, with some remarks under each heading. It leaves much for subsequent addition and correction, but it may serve as a basis for present discussion.

We may define "true" ankylosis as a more or less complete suppression of the normal mobility of a joint, due either to union of the opposed articular surfaces of fibrous or osseous tissue, or to changes in the capsular structures, or to a combination of these two conditions. Suppuration may play a part in any of the groups, but it is only with cases in which no evidence of pus formation is present that I propose to deal on this occasion. Conditions of "false" ankylosis, dependent upon causes lying outside the joint structures, will also be omitted from consideration.

It must of course be understood that the degree of limitation of movement that justifies the use of the term "ankylosis" is still unfixed; for while in the first group bony ankylosis leads to complete annihilation of motion, and fibrous ankylosis may be little less absolute, in the second group certain changes in the capsular structures may induce every possible degree of interference with the normal range of mobility, from a scarcely perceptible diminution to a complete suppression, and there must necessarily be a point at which the surgeon would cease to employ the word "ankylosis" at all. The difficulty, however, is rather academic than practical, and may be neglected.

1. THE INFLAMMATORY FORMS may be grouped according to their causation as follows:—(α) due to mechanical injuries; (β) due to local irritation set up by toxic elements conveyed by the circulation; and (γ) due to various affections of the nervous system. In the first and second groups, evidence of suppuration may or may not be present; the third is essentially non-suppurative.

(α) *From mechanical injuries.*—The injuries include severe contusions of joint surfaces, fractures into a joint, a variety of other accidental lesions that need not be specified, and lastly, surgical operations.

Cases of ankylosis from simple contusion are comparatively rare; but it is certain that such an injury, even in a comparatively healthy subject, may set up changes which may end in fibrous or even in bony union of the articular surfaces. Mr. Howard Marsh has related a case of bony ankylosis of the temporo-maxillary articulation caused by a heavy fall upon the chin, and the following case

may be taken as a type of a condition of fibrous ankylosis, which in the hip may closely simulate the osseous form.

The patient, a boy aged 18, was admitted into St. Thomas's Hospital in September, 1894, with a contusion of the right hip, caused by a fall from a height of ten feet upon the trochanter. He appears to have been a fairly healthy subject before the accident.

On admission the joint was painful and swollen, but freely moveable, and there was some febrile disturbance, the temperature reaching a maximum of  $101^{\circ}$ , but fluctuating considerably. At the end of thirteen days the symptoms subsided, and he left the hospital apparently well except for a slight limp on walking. After his discharge the imperfection of gait persisted, and the joint remained subject to occasional attacks of pain, which, however, did not prevent the patient from following his occupation; but gradually the stiffness increased, and at the end of a twelvemonth the joint had become absolutely rigid. He was readmitted on the 13th of February last. There was neither pain nor swelling about the articulation, but the movements, voluntary and passive, were completely lost, and the joint surfaces appeared to be united by bone. The thigh was fixed in a position of adduction ( $30^{\circ}$ ) and flexion ( $15^{\circ}$ ). Under an anæsthetic it was found that the ankylosis yielded to strong manipulation, and the thigh could then be moved to a limited degree in all directions. The gain, however, was not preserved, although persevering efforts were made to keep up the movements by manipulation, aided from time to time by chloroform, and at the present time the fixation of the hip is to all intents and purposes as complete as though an osseous ankylosis had occurred. In this case arthritis had been set up by the contusion of the surfaces, and the movements of the articulation, being painful, had been unconsciously suppressed by the patient until the two opposed surfaces had become firmly united by fibrous adhesions; adaptive changes had simultaneously taken place in the capsular structures, and the function of the joint was permanently destroyed. It is possible that the fibrous uniting material may eventually become bony. In a similar case, two years ago, it was necessary to perform osteotomy in order to rectify the inconvenient position assumed by the limb, and the consequent spinal deformity.

( $\beta$ ) Both suppurative and non-suppurative ankylosis may be set up by the local action of toxic elements conveyed by the blood.



They may arise from various *septicæmic conditions* in connection with typhoid fever, scarlet fever, &c. *Gonorrhœal arthritis* may also lead to a permanent ankylosis. I have now under observation a patient whose elbow is rigidly fixed at right angles as a result of gonorrhœal "rheumatism," in spite of repeated efforts to restore the function of the joint by passive movements. *Rheumatism* is a well-known and potent cause of non-suppurative ankylosis which may end in bony union of the surfaces. Mr. Bennett's case of osseous ankylosis of the temporo-maxillary articulation, brought before the Clinical Society a few years ago, may be taken as a type of the condition; but it is possible that many cases of ankylosis preceded by joint effusions of a very different origin have been wrongly assigned to the great "universal provider" of joint pains. *Gouty ankylosis* is better known to the physician than the surgeon, as few cases apply for surgical treatment. *Tubercular arthritis* is the most common cause of ankylosis preceded by supuration, and, as Mr. Howard Marsh has shown, it may lead to complete bony union of the joint surfaces without any evidence of pus formation. I have notes of three cases of the kind. It must, however, be remembered that pus formation is not always accompanied by visible signs of its presence or followed by external discharge. Lastly, a *syphilitic arthritis* must be accepted as a possible cause of ankylosis, but the termination is a rare one, and I have not yet been able to find records of any examples of it.

(γ) Ankyloses of inflammatory origin due to affections of the nervous system are less familiar than those of the preceding groups. *Charcot's disease* is said to give rise to bony ankylosis without suppuration, but the specimens that have been shown, all of foot bones, leave it doubtful whether the changes may not have been induced by pyogenic organisms admitted through a perforating ulcer. In a case under my own observation, where ankylosis had undoubtedly occurred, the integuments appeared to be entire, but on close examination the scar of a perforating ulcer was found under the metatarso-phalangeal joint of the great toe, and the first phalanx of the toe had become almost completely removed by a quiet process of disintegration and absorption that had not even attracted the attention of the patient.

In *chronic osteo-arthritis* (accepting this as a disease of nervous origin) ankylosis undoubtedly happens, but only, I believe, in an indirect way, by a process of ossification extending along the liga-

ments, or more rarely by fusion of osteophytes. A joint embarrassment which may simulate ankylosis is not infrequently induced by contact of osteophytic growth from opposed bones, but the growths seldom fuse. In the vertebral column, however, both processes, ligamentary ossification and fusion of osteophytes, may be met with, and as a secondary process the intervertebral discs may be replaced by bone.

The *division of a nerve* may possibly lead to joint effusions and ankylosis. Mr. Bowlby reports a case of section of the median nerve in which the joints became contracted and stiff, and one of the interphalangeal articulations was obliterated by bony union of the opposed surfaces. This occurrence is so exceptional, that one is tempted to attribute the ankylosis to some intercurrent disease of different origin, but the evidence offered by the case to be presently quoted tends to support the other view.

*Acute peripheral neuritis* may apparently induce arthropathic troubles not unlike those just related. A case was brought before the Medical Society by myself in 1894,<sup>1</sup> which can scarcely be explained on any other hypothesis. Its main features are as follows.

The patient, a boy of fifteen, was attacked, after a hard day's skating, with fever, accompanied by severe pains in the legs and effusion into all the joints of both lower extremities, from the hips to the toes, those of the rest of the body remaining intact. The acute signs were followed by ankylosis of the affected joints, the toes becoming fixed in a position of flexion at the phalangeal joints, the rest of the articulations in extension. A few weeks later it was seen that the joint lesions were accompanied by a well-marked atrophy of the skin of the lower limbs, with transverse *lineæ atrophicæ* and extreme degeneration of certain groups of leg muscles. There were no signs of cardiac disease, and no history of rheumatism in the patient or in his family. Under long and persevering use of massage, galvanism, and passive movements, the joints slowly regained the greater part of their mobility, and the patient made a fairly complete recovery without disablement, but not until more than two years after the beginning of the attack.

I believe that the pathology of this condition is best explained on the hypothesis of an acute peripheral neuritis determined by the combined influences of the lowering of temperature in the limbs by cold, and the functional overtax upon the neuro-mus-

<sup>1</sup> 'Transactions of the Medical Society,' vol. xvii, p. 104.

cular apparatus by the prolonged exertion in skating. This view is supported by the limitation of the affection to the joints of the lower limbs, the presence of atrophy and impaired sensation in the skin, and the wasting and degenerative reactions of certain groups of muscles. The contraction, effusion, and ankylosis bore considerable resemblance to the changes in Mr. Bowlby's case, and it is probable that the ankylosis would have eventually become bony in some of the joints had not energetic local treatment been adopted.

2. THE DEGENERATIVE FORMS of ankylosis may depend upon ossification of ligaments, and upon forcible and long-continued pressure of opposed articular surfaces against each other.

( $\alpha$ ) *Ossification of ligaments* may be seen in the vertebral column, and in the tarsal and carpal bones. It is usually a result of chronic osteo-arthritis, but sometimes occurs in cases where there is no evidence of this complaint. Most of the preparations in our museums show osteophytic formations, and it is from these that the ligamentous degeneration appears to start; but in a few there are no osteophytic prominences, and we are left in doubt whether they have ever existed, or whether they have disappeared by absorption as a natural result of the loss of movement in the articulation. Dr. Hilton Fagge's case, recorded in the 'Transactions of the Pathological Society' (vol. xxviii, p. 203), was probably an example of ossification of ligaments, and the softening of the bones noted as a special feature of the condition may have been only secondary to disease.

( $\beta$ ) Forcible and long-continued *compression of opposed articular surfaces* against each other may lead to the disappearance of cartilage and fusion of bones. Mr. Arbuthnot Lane has described cases of ankylosis of the cervical vertebræ in porters who carry weights on their heads; and Mr. Bland Sutton refers to analogous conditions in oxen which are yoked by the horns. The ankylosis taking place in extreme *lateral curvature* along the concave side of the spinal column is probably of the same nature, and is a sequel to the absorption of cartilage and direct contact of bony surfaces.

( $\gamma$ ) With these we may, perhaps, include as a degenerative process the adaptive rigidity of joints developed as a result of long-continued immobilisation, which also complicates joint diseases of an inflammatory nature.

3. Lastly, there are various obscure conditions, possibly of neurotic origin, which cannot at present be classified. The experience neces-



sary for a better comprehension of the group can only be arrived at by a publication of all examples with which we may be thrown into contact, and it is as a contribution to this record that I bring forward the following case.

The patient, who is in attendance for examination, is a man aged 30, of nervous temperament and slender configuration, free from any signs of inherited disease. He has been the subject since the age of ten of a series of subacute articular lesions arising without apparent cause, and terminating in fibrous or osseous ankylosis of the joints attacked.

During the first ten years of his life he was strong and active, and had suffered only from the ordinary illnesses of childhood. There was no history of gout, rheumatism, tuberculosis, or syphilis in his family.

At the age of ten his right wrist became swollen and painful without apparent cause. The symptoms, however, were of little severity, and unattended by constitutional disturbance. After some weeks of treatment at a neighbouring hospital the swelling subsided, leaving an ankylosis of the radio-carpal articulation, but free inter-carpal movement. A year later the right knee was similarly attacked, and after a long course of unavailing treatment it became contracted and rigidly fixed at an angle of  $50^{\circ}$  by bony ankylosis involving the femur, patella, and tibia. In the following year (at the age of twelve) the right ankle and tarsal joints were affected, leaving very slight movement in the former, and apparently consolidating the whole of the tarsus and the bases of the metatarsal bones. About the same time the right middle finger became partially paralysed, and ceased to grow in proportion to the rest of the hand. At the age of thirteen the left elbow was affected, and at fifteen the right elbow, leaving in both cases fibrous ankylosis (at right angles) with only 5 to 10 degrees of movement, but not interfering with radio-ulnar rotation. At sixteen the left wrist followed suit, the radio-carpal joint apparently undergoing bony union, while the intercarpal joints remained intact.

At the age of eighteen an eversion of both great toes was noticed, the right toe eventually forming a right angle with the metatarsal bone, and this distortion seems to have occurred independently of mechanical compression, as the patient says that his boots had always been roomy and square-toed. In the next year the right shoulder succumbed after a slight overstrain in carrying a heavy

trunk, and bony ankylosis followed. Since that time he has suffered only from lesser manifestations, but is perhaps not yet at the end of his troubles. The first phalangeal joints of both ring fingers became affected (the right at the age of twenty-three, and the left at twenty-eight), losing, however, about  $10^{\circ}$  of movement, and a few months ago tenderness and swelling appeared in the first phalangeal joint of the left little finger, but no ankylosis has yet set in. Finally, during the past fortnight the right shoulder has become painful and tender. In addition to the more recent joint lesions, about two years ago signs of vaso-motor paralysis appeared in the right leg, and the limb has since been perspiring profusely, and is very susceptible to changes of temperature.

The man was sent into St. Thomas's Hospital in March, 1895, for amputation of the useless left leg, deformed by the contraction of the knee and a severe hallux valgus. The knee was, however, straightened by a cuneiform osteotomy, and the toe by a resection of the head of the metatarsal bone, and the limb is now a useful one.

The angular piece of bone removed from the knee included the patella, and the osseous texture was noticed to be unnaturally hard and resistant to the saw. No sign of the original joint fissure was apparent.

The ankylosed joints are free from tenderness or swelling; they present no osteophytic formations, and the slight movement possible in some of the affected articulations is quite painless. The muscles acting upon the joints are of course atrophied in proportion to the degree of suppression of function. The patient shows no ataxic symptoms, and all the functions apart from locomotion appear to be normal.

Here, then, is an example of a disease affecting several joints at varying intervals extending over a period of twenty years, each attack beginning with a moderate degree of swelling and pain in the articulation, but without constitutional disturbance, and always (excepting the joints most recently affected) terminating in fibrous or bony ankylosis. No clue has been found to the origin of the inflammatory process. There is no evidence of inherited disease, and although the onset of each attack bore some resemblance to subacute rheumatism, it would be unsafe, in view of the history, course, and termination, to assume that the affection was truly rheumatic. There are, moreover, certain elements in the patient's condition

pointing to a neurosis as a possible cause, such as the semi-paralytic and stunted finger, and the vaso-motor paralysis of the right leg, and to these may be added the nervous excitability of the patient; but I can only ask the help of the Society in deciding the nature of the case. The sole recorded example I have been able to trace that bears any resemblance to it is one quoted by Mr. Howard Marsh from notes lent to him by Dr. Griffiths of Cambridge. It is to be hoped that we may have the advantage of hearing more of this case from Dr. Griffiths.

